

What is claimed is:

1. An image forming apparatus comprising:
an image bearing member on which a latent image is formed;
5 a plurality of developing devices for developing said latent image, each of said developing devices containing developer; and
a turnable turning member on which said plurality of developing devices are mounted,
wherein said turning member is caused to turn based on a
10 turn history of said turning member.
2. An image forming apparatus according to claim 1, wherein:
each of said developing devices has two developer containers
that contain said developer when the developing device is
15 positioned in a developing position for developing said latent image; and
when said turning member is caused to turn, said developer contained in each of said two developer containers is mixed.
- 20 3. An image forming apparatus according to claim 2, wherein:
one of said two developer containers has a developer supplying section for supplying said developer to said image bearing member; and
said developer supplying section of each said developing
25 device is at a lower portion of that developing device when that developing device is positioned in said developing position.
4. An image forming apparatus according to claim 1, wherein:
each of said developing devices does not have a stirring
30 member for stirring said developer.

5. An image forming apparatus according to claim 1, wherein:
an image formed by developing said latent image is output
by being transferred onto a medium; and

5 said turn history is a history value according to
 a number of said medium that has been output, and
 a number of times of turns of said turning member.

6. An image forming apparatus according to claim 5, wherein:
10 said image forming apparatus comprises

 a detector for detecting the turn of said turning
 member, and

 a counter for counting the output of said detector;
 and

15 the number of times of turns of said turning member is a
number counted by said counter.

7. An image forming apparatus according to claim 5, wherein:
output of said image on said medium is executed according
20 to an output command; and

 the number of times of turns of said turning member is
estimated according to said output command.

8. An image forming apparatus according to claim 7, wherein:
25 the estimation is executed every time said medium is output.

9. An image forming apparatus according to claim 7, wherein:
 the estimation is executed every time a predetermined number
of said medium is output.

10. An image forming apparatus according to claim 7, wherein:
the estimation is executed for every output job by which
said medium is output.

5 11. An image forming apparatus according to claim 10, wherein:
said estimation is executed every time a predetermined
number of said medium is output according to said output job using
a certain one of said developing devices without said turning
member being turned.

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12. An image forming apparatus according to claim 11, wherein:
said plurality of developing devices each contains
developer of a different color including black; and
said certain one of developing devices is the developing
15 device containing the black developer.

13. An image forming apparatus according to claim 5, wherein:
said history value is a turn value that indicates a ratio
between

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said number of said medium that has been output, and
said number of times of turns of said turning member.

14. An image forming apparatus according to claim 13, wherein:
said turning member is caused to turn when said turn value
25 is smaller than a preset reference value as a result of comparison
between said turn value and said reference value.

15. An image forming apparatus according to claim 5, wherein:
said turning member is caused to turn every time a
30 predetermined number of said medium is output.

16. An image forming apparatus according to claim 14, wherein:
said image forming apparatus comprises a storage element
capable of storing various kinds of information; and

5 said reference value is changeable according to said
information in said storage element.

17. An image forming apparatus according to claim 16, wherein:
said information is about a remaining amount of said
10 developer contained in a container provided in each of said
developing devices.

18. An image forming apparatus according to claim 16, wherein:
said information is about an amount of said medium that is
15 output using each of said developing devices.

19. An image forming apparatus according to claim 16, wherein:
said storage element is provided in/on each of said
developing devices.

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20. An image forming apparatus comprising:
an image bearing member on which a latent image is formed;
a plurality of developing devices for developing said latent
image, each of said developing devices containing developer; and
25 a turnable turning member on which said plurality of
developing devices are mounted, wherein:

each of said developing devices has two developer containers
that contain said developer when the developing device is
positioned in a developing position for developing said latent
30 image;

one of said two developer containers has a developer supplying section for supplying said developer to said image bearing member;

5 said developer supplying section of each said developing device is at a lower portion of that developing device when that developing device is positioned in said developing position;

 said developing device has a storage element capable of storing

10 information about a remaining amount of said developer contained in said container, and
 information about an amount of medium that is output using each of said developing devices;

 each of said developing devices does not have a stirring member for stirring said developer;

15 an image formed by developing said latent image is output by being transferred onto said medium;

 said turning member is caused to turn every time a predetermined number of said medium is output;

20 said image forming apparatus further comprises
 a detector for detecting the turn of said turning member, and
 a counter for counting the output of said detector;
 and

25 said turning member is caused to turn to mix said developer contained in each of said two developer containers when a turn value that indicates a ratio between

 the number of said medium that has been output, and
 said number counted by said counter
30 is smaller than a preset reference value that is changeable according to said information in said storage element as a result

of comparison between said turn value and said reference value.

21. An image forming apparatus comprising:

an image bearing member on which a latent image is formed;

5 a plurality of developing devices for developing said latent image, each of said developing devices containing developer; and
a turnable turning member on which said plurality of developing devices are mounted,

wherein, according to an output command, said image forming
10 apparatus outputs an image formed by developing said latent image by transferring said image onto a medium; and

wherein said turning member is caused to turn at least either at the beginning or the end of an output job for outputting said medium.

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22. A computer-readable storage medium having recorded thereon a program for making

an image forming apparatus comprising:

an image bearing member on which a latent image is
20 formed;

a plurality of developing devices for developing said latent image, each of said developing devices containing developer; and

25 a turnable turning member on which said plurality of developing devices are mounted,

achieve a function of causing said turning member to turn based on a turn history of said turning member.

23. A computer system comprising:

30 an image forming apparatus having:

an image bearing member on which a latent image is formed;

a plurality of developing devices for developing said latent image, each of said developing devices containing developer; and

a turnable turning member on which said plurality of developing devices are mounted,

wherein said turning member is caused to turn based on a turn history of said turning member.

24. A method for forming an image with an image forming apparatus having:

an image bearing member on which a latent image is formed;

a plurality of developing devices for developing said latent image, each of said developing devices containing developer; and

a turnable turning member on which said plurality of developing devices are mounted,

said method comprising the step of:

causing said turning member to turn based on a turn history of said turning member.

25. A computer-readable storage medium having recorded thereon a program for making

an image forming apparatus comprising:

an image bearing member on which a latent image is formed;

a plurality of developing devices for developing said latent image, each of said developing devices

containing developer; and

a turnable turning member on which said plurality of developing devices are mounted;

said image forming apparatus outputting, according to an output command, an image formed by developing said latent image by transferring said image onto a medium,

achieve a function of causing said turning member to turn at least either at the beginning or the end of an output job for outputting said medium.

26. A computer system comprising:

an image forming apparatus having:

an image bearing member on which a latent image is formed;

a plurality of developing devices for developing said latent image, each of said developing devices containing developer; and

a turnable turning member on which said plurality of developing devices are mounted,

wherein, according to an output command, said image forming apparatus outputs an image formed by developing said latent image by transferring said image onto a medium; and

wherein said turning member is caused to turn at least either at the beginning or the end of an output job for outputting said medium.

27. A method for forming an image with an image forming apparatus having:

an image bearing member on which a latent image is

formed;

a plurality of developing devices for developing said latent image, each of said developing devices containing developer; and

5 a turnable turning member on which said plurality of developing devices are mounted;

said image forming apparatus outputting, according to an output command, an image formed by developing said latent image by transferring said image onto a
10 medium,

said method comprising the step of:

causing said turning member to turn at least either at the beginning or the end of an output job for outputting said medium.

15 28. A color image forming apparatus comprising:

a plurality of developing devices, each of said developing devices

containing developer that includes a predetermined ratio in volume of developer particles having a
20 diameter of a predetermined value or less, and being capable of developing a latent image using said developer contained therein,

wherein said image forming apparatus forms a color image by performing development successively with each of said
25 plurality of developing devices to superimpose different kinds of said developer;

wherein said plurality of developing devices include

a first developing device whose said ratio in volume of said developer particles is R_1 , and

30 a second developing device whose said ratio in volume

of said developer particles is R2; and

wherein said first developing device and said second developing device satisfy all of the following conditions (1) through (3):

5 (1) the order in which said first developing device and said second developing device perform development is other than first in order;

(2) said second developing device performs development later than said first developing device; and

10 (3) R1 is larger than R2.

29. A color image forming apparatus according to claim 28, wherein:

15 the developing devices, among said plurality of developing devices other than the developing device that performs development first, perform development according to an order in which a developing device having a smaller said ratio in volume performs development later in order.

20 30. A color image forming apparatus according to claim 28, wherein:

said predetermined value is 5 μm .

25 31. A color image forming apparatus according to claim 28, wherein:

said ratio in volume for the developing device that performs development first among said plurality of developing devices is larger than said ratio in volume for each of the other developing devices.

32. A color image forming apparatus according to claim 28,
wherein:

said developer includes conductive metal oxide as an
external additive.

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33. A color image forming apparatus according to claim 28,
wherein:

when assuming that a charge amount of said developer
contained in said first developing device is E1, and a charge
10 amount of said developer contained in said second developing
device is E2,

E1 is larger than E2.

34. A color image forming apparatus according to claim 33,
15 wherein:

said developer includes

a core particle, and

conductive metal oxide as an external additive
associated on said core particle; and

20 when assuming that an amount of said external additive of
the developer in said first developing device is A1, and an amount
of said external additive of the developer in said second
developing device is A2,

A1 is larger than A2.

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35. A color image forming apparatus according to claim 33,
wherein:

said developer includes

a core particle, and

30 conductive metal oxide as an external additive

associated on said core particle; and

when assuming that a charge amount of said core particle of the developer in said first developing device is M1, and a charge amount of said core particle of the developer in said second
5 developing device is M2,

M1 is larger than M2.

36. A color image forming apparatus according to claim 28,
wherein:

10 a volume average particle diameter of the developer in said first developing device is equal to a volume average particle diameter of the developer in said second developing device.

37. A color image forming apparatus according to claim 28,
15 further comprising:

an image bearing member for bearing said latent image; and
a transferring medium that serves as a medium when transferring a developer image made visible on said image bearing member onto a transferring material,

20 wherein said image forming apparatus forms said color image by performing an operation of

making said latent image bore on said image bearing member visible as said developer image using each of said developing devices,

25 placing said image bearing member and said transferring medium in contact with each other, and transferring said developer image onto said transferring medium

successively with each of said plurality of developing devices
30 to superimpose different kinds of said developer onto said

transferring medium.

38. A color image forming apparatus comprising:

5 a plurality of developing devices, each of said developing devices

containing developer that includes a predetermined ratio in volume of developer particles having a diameter of a predetermined value or less, and being capable of developing a latent image using said developer contained therein, wherein:

10 said image forming apparatus forms a color image by performing development successively with each of said plurality of developing devices to superimpose different kinds of said developer;

15 said plurality of developing devices include a first developing device whose said ratio in volume of said developer particles is R_1 , and a second developing device whose said ratio in volume of said developer particles is R_2 ;

20 said first developing device and said second developing device satisfy all of the following conditions (1) through (3):

- (1) the order in which said first developing device and said second developing device perform development is other than first in order;
- 25 (2) said second developing device performs development later than said first developing device; and
- (3) R_1 is larger than R_2 ;

the developing devices, among said plurality of developing devices other than the developing device that performs

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development first, perform development according to an order in which a developing device having a smaller said ratio in volume performs development later in order;

said predetermined value is 5 μm ;

5 said ratio in volume for the developing device that performs development first among said plurality of developing devices is larger than said ratio in volume for each of the other developing devices;

10 when assuming that a charge amount of said developer contained in said first developing device is E1, and a charge amount of said developer contained in said second developing device is E2, E1 is larger than E2;

said developer includes

15 a core particle, and
conductive metal oxide as an external additive
associated on said core particle;

20 when assuming that an amount of said external additive of the developer in said first developing device is A1, and an amount of said external additive of the developer in said second developing device is A2, A1 is larger than A2;

when assuming that a charge amount of said core particle of the developer in said first developing device is M1, and a charge amount of said core particle of the developer in said second developing device is M2, M1 is larger than M2;

25 a volume average particle diameter of the developer in said first developing device is equal to a volume average particle diameter of the developer in said second developing device;

said image forming apparatus further comprises:

30 an image bearing member for bearing said latent image;
and

a transferring medium that serves as a medium when transferring a developer image made visible on said image bearing member onto a transferring material; and

5 said image forming apparatus forms said color image by performing an operation of

making said latent image bore on said image bearing member visible as said developer image using each of said developing devices,

10 placing said image bearing member and said transferring medium in contact with each other, and transferring said developer image onto said transferring medium

successively with each of said plurality of developing devices
15 to superimpose different kinds of said developer onto said transferring medium.

39. A method of forming a color image comprising:

20 a step of performing development successively with each of a plurality of developing devices to superimpose different kinds of developer to form a color image, each of said developing devices containing developer that includes a predetermined ratio in volume of developer particles having a diameter of at most a predetermined value, and
25 being capable of developing a latent image using said developer contained therein,

wherein said plurality of developing devices include

30 a first developing device whose said ratio in volume of said developer particles is R_1 , and
a second developing device whose said ratio in volume

of said developer particles is R_2 ; and

wherein said first developing device and said second developing device satisfy all of the following conditions (1) through (3):

5 (1) the order in which said first developing device and said second developing device perform development is other than first in order;

 (2) said second developing device performs development later than said first developing device; and

10 (3) R_1 is larger than R_2 .

40. . A computer system comprising:

a computer;

a display device that is connectable to said computer; and

15 a color image forming apparatus that is connectable to said computer and that has a plurality of developing devices, each of said developing devices

 containing developer that includes a predetermined ratio in volume of developer particles having a diameter of a predetermined value or less, and
20 being capable of developing a latent image using said developer contained therein;

 said image forming apparatus forming a color image by performing development successively with each of said plurality of developing devices to superimpose different
25 kinds of said developer;

 said plurality of developing devices including

 a first developing device whose said ratio in volume of said developer particles is R_1 , and

30 a second developing device whose said ratio in volume

of said developer particles is R2; and
said first developing device and said second developing
device satisfying all of the following conditions (1)
through (3):

- 5 (1) the order in which said first developing device
 and said second developing device perform development
 is other than first in order;
 (2) said second developing device performs
 development later than said first developing device;
10 and
 (3) R1 is larger than R2.

41. A color image forming apparatus comprising:

 an image bearing member for bearing a latent image;
15 a plurality of developing devices, each of said developing
 devices

 containing developer that includes a predetermined
 ratio in volume of developer particles having a
 diameter of a predetermined value or less, and
20 being capable of developing said latent image using
 said developer contained therein; and

 a transferring medium that serves as a medium when
transferring the developer on said image bearing member onto a
transferring material,

25 wherein said image forming apparatus forms a color image
by performing an operation of

 developing said latent image bore on said image
 bearing member with said developer using each of said
 developing devices, and
30 transferring the developer on said image bearing

member onto said transferring medium in a state in which said image bearing member and said transferring medium are in contact with each other successively with each of said plurality of developing devices to superimpose different kinds of said developer onto said transferring medium;

wherein said plurality of developing devices include a first developing device whose said ratio in volume of said developer particles is R_1 , and a second developing device whose said ratio in volume of said developer particles is R_2 ; and

wherein said first developing device and said second developing device satisfy both of the following conditions (1) and (2):

- (1) said second developing device performs development later than said first developing device; and
- (2) R_2 is larger than R_1 .

42. A color image forming apparatus according to claim 41, wherein:

said plurality of developing devices perform development according to an order in which a developing device having a smaller said ratio in volume performs development earlier in order.

43. A color image forming apparatus according to claim 42, wherein:

among said plurality of developing devices, the developing device performing development first in order contains yellow developer.

44. A color image forming apparatus according to claim 42,
wherein:

among said plurality of developing devices, the developing
device performing development last in order contains black
5 developer.

45. A color image forming apparatus according to claim 41,
wherein:

said predetermined value is 5 μm .

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46. A color image forming apparatus according to claim 41,
wherein:

a coefficient of static friction of the surface of said image
bearing member is larger than a coefficient of static friction
15 of the surface of said transferring medium.

47. A color image forming apparatus according to claim 41,
wherein:

said developer includes conductive metal oxide as an
20 external additive.

48. A color image forming apparatus according to claim 41,
wherein:

when assuming that a charge amount of said developer
25 contained in said first developing device is E1, and a charge
amount of said developer contained in said second developing
device is E2,

E2 is larger than E1.

30 49. A color image forming apparatus according to claim 48,

wherein:

said developer includes

a core particle, and

conductive metal oxide as an external additive

5 associated on said core particle; and

when assuming that an amount of said external additive of the developer in said first developing device is A1, and an amount of said external additive of the developer in said second developing device is A2,

10 A2 is larger than A1.

50. A color image forming apparatus according to claim 48, wherein:

said developer includes

15 a core particle, and

conductive metal oxide as an external additive

associated on said core particle; and

when assuming that a charge amount of said core particle of the developer in said first developing device is M1, and a charge amount of said core particle of the developer in said second developing device is M2,

20 M2 is larger than M1.

51. A color image forming apparatus according to claim 41, wherein:

25 a volume average particle diameter of the developer in said first developing device is equal to a volume average particle diameter of the developer in said second developing device.

30 52. A color image forming apparatus comprising:

an image bearing member for bearing a latent image;
a plurality of developing devices, each of said developing
devices

5 containing developer that includes a predetermined
ratio in volume of developer particles having a
diameter of a predetermined value or less, and
being capable of developing said latent image using
said developer contained therein; and

10 a transferring medium that serves as a medium when
transferring the developer on said image bearing member onto a
transferring material, wherein:

said image forming apparatus forms a color image by
performing an operation of

15 developing said latent image bore on said image
bearing member with said developer using each of said
developing devices, and

transferring the developer on said image bearing
member onto said transferring medium in a state in
which said image bearing member and said transferring
20 medium are in contact with each other

successively with each of said plurality of developing devices
to superimpose different kinds of said developer onto said
transferring medium;

25 said plurality of developing devices include
a first developing device whose said ratio in volume
of said developer particles is R_1 , and
a second developing device whose said ratio in volume
of said developer particles is R_2 ;

30 said first developing device and said second developing
device satisfy both of the following conditions (1) and (2):

(1) said second developing device performs development later than said first developing device; and

(2) R2 is larger than R1;

said plurality of developing devices perform development
5 according to an order in which a developing device having a smaller said ratio in volume performs development earlier in order;

among said plurality of developing devices, the developing device performing development first in order contains yellow developer;

10 among said plurality of developing devices, the developing device performing development last in order contains black developer;

said predetermined value is 5 μm ;

a coefficient of static friction of the surface of said image
15 bearing member is larger than a coefficient of static friction of the surface of said transferring medium;

when assuming that a charge amount of said developer contained in said first developing device is E1, and a charge amount of said developer contained in said second developing
20 device is E2, E2 is larger than E1;

said developer includes

a core particle, and

conductive metal oxide as an external additive associated on said core particle;

25 when assuming that an amount of said external additive of the developer in said first developing device is A1, and an amount of said external additive of the developer in said second developing device is A2, A2 is larger than A1;

when assuming that a charge amount of said core particle
30 of the developer in said first developing device is M1, and a charge

amount of said core particle of the developer in said second developing device is M_2 , M_2 is larger than M_1 ; and

a volume average particle diameter of the developer in said first developing device is equal to a volume average particle diameter of the developer in said second developing device.

53. A method for forming a color image with a color image forming apparatus having:

10 an image bearing member for bearing a latent image;
a plurality of developing devices, each of said developing devices

containing developer that includes a predetermined ratio in volume of developer particles having a diameter of a predetermined value or less, and

15 being capable of developing said latent image using said developer contained therein; and

a transferring medium that serves as a medium when transferring the developer on said image bearing member onto a transferring material,

20 wherein said plurality of developing devices includes

a first developing device whose said ratio in volume of said developer particles is R_1 , and

25 a second developing device whose said ratio in volume of said developer particles is R_2 , and

wherein said first developing device and said second developing device satisfy both of the following conditions

(1) and (2):

30 (1) said second developing device performs development later than said first developing device;

and

(2) R2 is larger than R1,
said method comprising the step of:
performing an operation of

5 developing said latent image bore on said image
 bearing member with said developer using each of said
 developing devices, and
 transferring the developer on said image bearing
 member onto said transferring medium in a state in
10 which said image bearing member and said transferring
 medium are in contact with each other
 successively with each of said plurality of developing devices
 to superimpose different kinds of said developer onto said
 transferring medium.

15 54. A computer system comprising:

 a computer;

 a display device that is connectable to said computer; and
 a color image forming apparatus that is connectable to said

20 computer and that has:

 an image bearing member for bearing a latent image;
 a plurality of developing devices, each of said
 developing devices

 containing developer that includes a
25 predetermined ratio in volume of developer
 particles having a diameter of a predetermined
 value or less, and

 being capable of developing said latent image
 using said developer contained therein; and

30 a transferring medium that serves as a medium when

transferring the developer on said image bearing member onto a transferring material, said image forming apparatus forming a color image by performing an operation of

5 developing said latent image bore on said image bearing member with said developer using each of said developing devices, and

transferring the developer on said image bearing member onto said transferring medium in a state in which said image bearing member and said transferring medium are in contact with each other

10 successively with each of said plurality of developing devices to superimpose different kinds of said developer onto said transferring medium;

15 said plurality of developing devices including

 a first developing device whose said ratio in volume of said developer particles is R_1 , and

 a second developing device whose said ratio in volume of said developer particles is R_2 ; and

20 said first developing device and said second developing device satisfying both of the following conditions (1) and (2):

 (1) said second developing device performs development later than said first developing device;

25 and

 (2) R_2 is larger than R_1 .